Backup and Restore Services for Open Systems

Product Summary

DET owns and maintains IBM's Tivoli Storage Manager (TSM) software for backup and restore services in their Salt Lake City and Richfield data centers. This environment is available for agencies with the following applications:

- Open Systems servers hosted in the Salt Lake City or Richfield data centers.
- Open Systems servers with State of Utah WAN connectivity hosted at agency sites outside the Salt Lake City and Richfield data centers.

Description of Services

The DET backup and restore environment is represented in **Figure 1**.

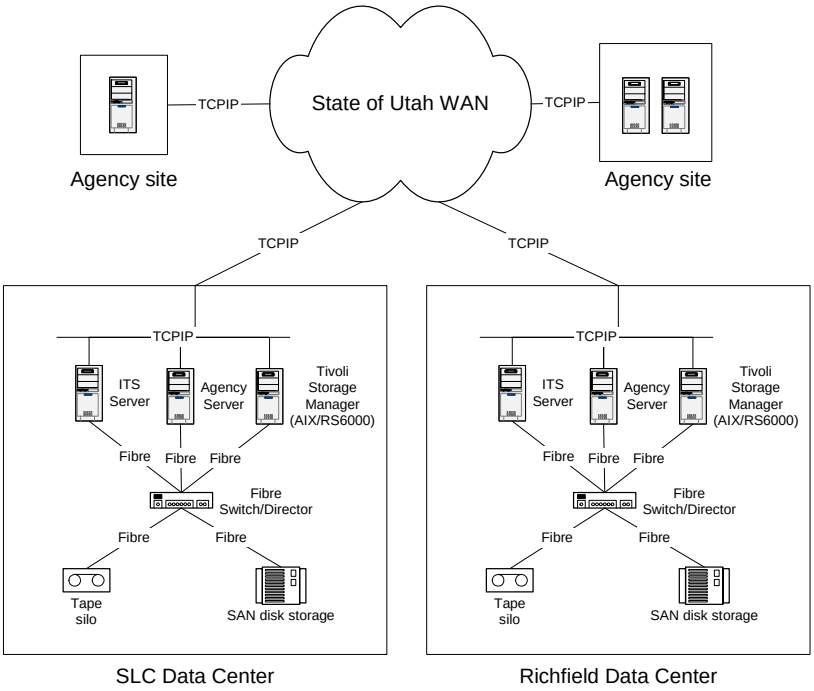

Figure 1: DET Tivoli Storage Manager Environment

Disk and tape storage space in this environment is currently provided by an EMC CX700 and StorageTek T9840 tape drives running in StorageTek PowderHorn tape silos.

TCP/IP connectivity is used from file servers to the Tivoli server. The Tivoli server is attached to the SAN disk and tape environment via Fibre Channel.

Product Benefit

Benefits	
IBM Tivoli Storage Manager	• Enterprise storage management solution providing automated, unattended backups. • Supports a broad range of client and file server platforms. • Robust administrator capabilities to manage the TSM server from any TSM client platform. • Easy-to-use Web interfaces for daily administrative and user tasks. • Extensive storage device support. • Robust server database. • Online, incremental backup and recovery for Oracle, Informix, and other DB types. • Compression to reduce network traffic, transmission time, and TSM server storage requirements. • Multitasking capability—multiple TSM client sessions. • Online and offline database backup and archive support. • Open API providing critical online backup services to data-intensive applications. • Incremental backups are all that are ever needed (no full backups except for the first backup).
DET Data Center	• Climate controlled environment. • Multi-tiered physically secure environment. • 24x7 monitoring of systems. • Tier 3 Data Center providing managed redundancy for power generation systems and uninterruptible power sources with battery backup.

IBM TSM Overview

IBM's Tivoli Storage Manager (TSM) is an enterprise-wide storage management application that utilizes the State's Wide Area Network (WAN). TSM provides automated, centrally scheduled, policy-managed backup services for file-servers. TSM supports multi-vendor servers of various sizes and operating systems, which are connected via WAN, LAN, and SAN. TSM fits virtually all of today's heterogeneous network environments with extensive platform capability and ensures data integrity through consistent policy management, thus reducing customers' time and system resource requirements.

TSM is a "transaction" oriented backup system. The main philosophy behind TSM is to only backup "changed" data. Upon initial backup with TSM, the product proceeds with a "full" backup of the clients' data. The subsequent backup sessions are incremental in nature and only "changed" data is backed-up. TSM tracks data in a RDBMS database. This reduces traffic on the network and disk and tape resource usage. Based on TSM policies, the TSM server stores client files on disk or tape volumes in data storage. The TSM data storage is allocated, defined, and grouped into storage pools (see *Configuration Options* below.)

TSM backs up and restores application data files only. Tivoli does not support "bare-metal" restore of the client's operating system. Performing a bare-metal restore involves the following process:

- Restoration of the Operating System (OS) environment via platform-specific utilities (Ghost, MKSYSB, Ignite, etc.).
- Re-application of OS patches.
- Re-installation and configuration of the applicable TSM backup and archive client software.
- Data restoration via TSM over the network.

DET Responsibilities

Administration of the backup and restore environment is accomplished by a team of two:

- The TSM Server Administrator (DET)
- The client Server Administrator (customer)

(See **Figure 2**) The partnership between these two administrators helps ensure that data is managed according to the needs of the customer agency.

DET Responsibilities

TSM Server Administration (DET Staff)

The TSM servers in the DET data centers are centrally managed by a TSM Administrator. The duties of the TSM Server Administrator include:

- Manage the overall enterprise Tivoli environment.
- Provide orientation materials for client Server Administrators.
- Define and manage storage pools.
- Work with customer client Server Administrators to define and manage backup and restore policies for individual servers.
- Provide 24x7 support for issues encountered by client Server Administrators during data restores.
- Notify client Server Administrators of missed or failed backups.
- Provide other assistance and/or consultation as needed.

Customer Responsibilities

Customer Responsibilities
Customer Client Server Administration (Customer or DET Staff) The customer client Server Administrator is the steward of the data managed by individual servers. This administrator is identified when Tivoli services are first ordered. This person understands the data and understands the business needs of the customer agency. As a result, Tivoli administration on client servers that are being backed up via TSM is usually managed by the System Administrator for that server. This System Administrator is normally a staff member of the customer agency. However, if an agency has contracted with DET to provide system administration (or Tivoli administration duties) for a specific server, then DET staff will perform Tivoli administration on that server. If the System Administrator for the client server is a different person than the one who manages applications on the server, the System Administrator and Application Manager must work together to ensure that backup policies for the machine are appropriate for the application. For instance, if the server is a database server where one person administers the hardware and operating system and another person administers the database, these two people should work together to ensure that backup policies meet the needs of the database on that server.
Client server administration duties include the following: • Learn and understand how to perform Tivoli client server administration tasks. • Installation and customization of the backup and archive client software on the client server. • Work with the DET TSM Server Administrator to define and manage backup and restore policies. • Work with the person who manages applications on the client server to ensure backup policy definitions are appropriate for the application. • Create and manage client server-specific include and exclude lists. • Work with the DET TSM Server Administrator to do backup and restore performance tests. • Monitor whether backups were successful and whether the correct data was backed up. • Take action to correct missed or failed backups. (The DET TSM Server Administrator is available for assistance.) • Manage data restores. (The DET TSM Server Administrator is available for assistance.)

Client Server Administrator Tools

The Tivoli administration tool for client servers is a backup and archive software client utility installed on the server. This utility is provided to the customer by DET and has the following interfaces for administration duties:

- A software GUI for most operating system platforms.
- A command-line interface.

- An API.
- A web-based interface used to access administration tools from remote PCs.
- DET does not currently support the archive features of the client utilities.

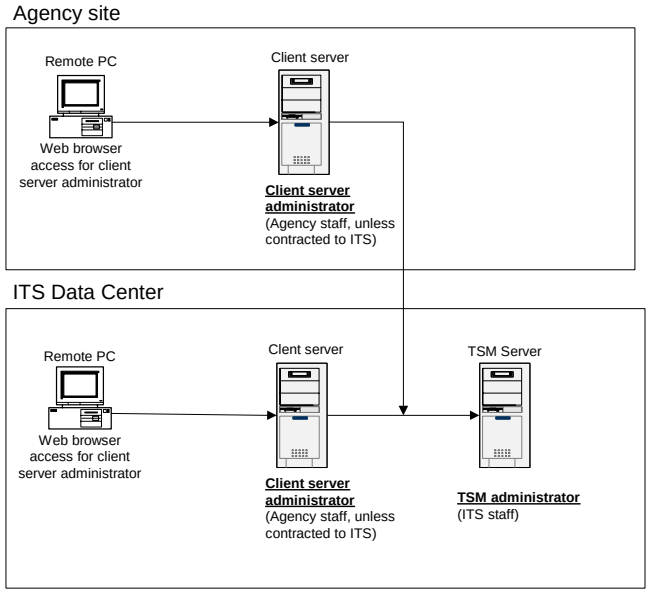

Figure 2: Division of administrative responsibilities

Configuration Options

Data backed up with TSM is stored in storage pools. A storage pool defines where the backups are physically stored. In the DET Tivoli environment there are three-storage pool options (see **Figure 3**):

- **Option 1: One primary backup pool -** The primary backup pool resides on tape in the primary data center.
- **Option 2: One primary backup pool and one remote copy pool -** The primary backup pool resides on tape in the primary data center. The remote copy pool stores data offsite for disaster recovery-type scenarios.
- **Option 3: One primary backup pool, one local copy pool, and one remote copy pool -** Both the primary backup pool and local copy pool reside on tape in the primary data center. The local copy pool provides a complete copy of the data in the primary backup pool in case of a tape failure in the primary backup pool. The remote copy pool stores data offsite for disaster recovery-type scenarios.

As backup data streams into the TSM server over the network, backup data is stored temporarily on SAN disk storage. This temporary storage is spooled off to the primary and/or copy pools during production hours the next day.

The customer and DET will work together to determine which configuration option best suits customer needs. Costs are important to consider in making this determination. For instance, **Options 2** and **3** respectively use two and three times as much storage space as **Option 1**. Since fees for *Tivoli Backup and Restore Services* are based on a per megabyte rate, **Options 2** and **3** are therefore more expensive — although they provide a higher level of backup protection.

Choosing a Primary Data Center for Backups

When a server is configured for backups via the DET TSM environment, the TSM Server Administrator chooses one of the DET data centers as the "primary data center." The primary data center is the data center where the TSM server resides. Local storage pools are located in the primary data center. If Salt Lake City is chosen as the primary data center, then the remote pool is located in Richfield. If Richfield is chosen as the primary data center, then the remote pool is located in Salt Lake City.

Depending on customer need, agencies may request either Salt Lake City or Richfield as the primary data center for backups. Typically the physically closest data center is preferred for faster backup and restores times, but DET will work with the agency to determine which data center best fits agency needs.

Backup Policies

TSM backup policies control how backups are done. These policies control how long files are kept and where they are stored.

Backup policies govern parameters such as:

- Which files and directories are backed up?
- Where files can be stored.
- How many days must elapse before a file can be backed up again?
- How to handle files that are in use during backup.
- Where the server stores backup versions of files and directories.
- How many backup versions the server keeps of changed files and directories.
- How long the server keeps backup versions of files and directories.

A file is considered for backup only if it has changed since the last backup. The file is considered changed if the date on which the file was last modified is changed, the file size has changed, the file owner is changed, or the file permission has changed.

A list of DET TSM standard backup policies can be obtained from the TSM Server Administrator. Customized policies can be created where needed based on application-specific needs.

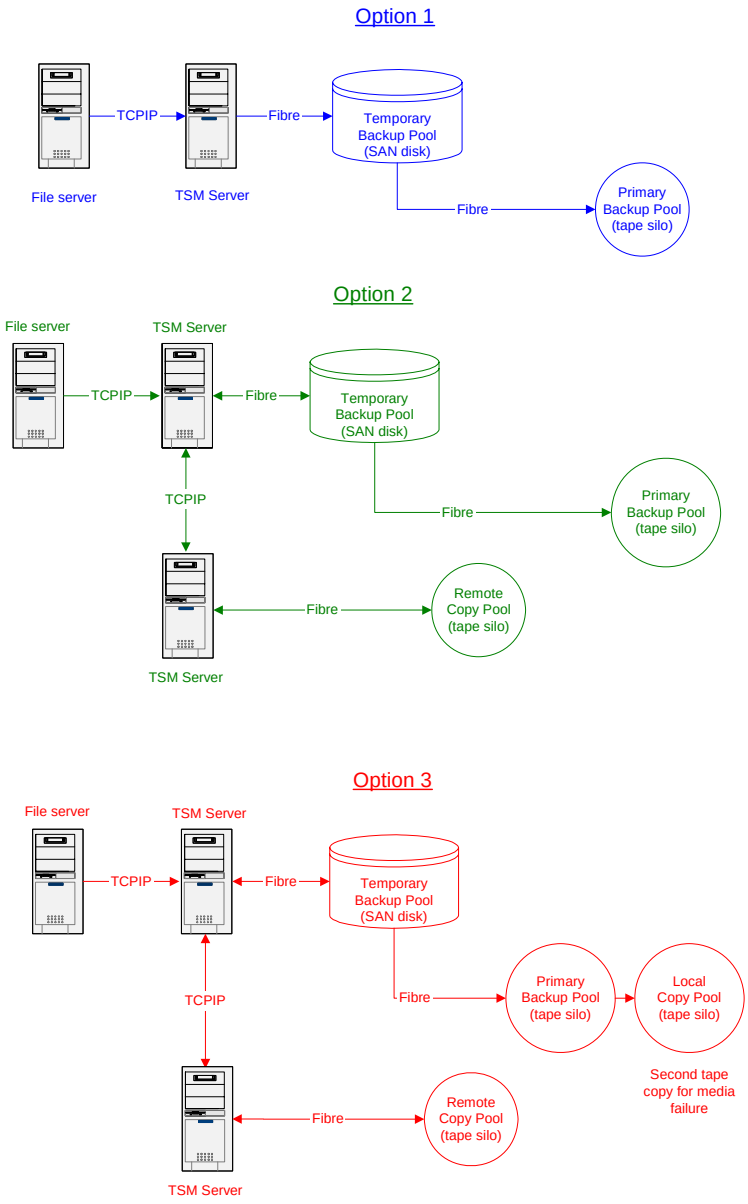

Figure 3: Storage pool options

TSM and Databases

If the client server being backed up is a database server, Tivoli can be used to do cold back ups of the database. “Hot backups” are also possible by using additional software called Tivoli data protection agents. These agents have various database-specific dependencies and require:

- Additional licensing fees which are paid for by the customer agency.
- Expertise on the part of the customer agency in using these agents.

Database Administrators can use several techniques to back up databases with TSM. These techniques use either the operating system utilities, the RDBMS utilities, or either of these combined with TSM. There are nearly two hundred various Redbooks available from IBM on how to set up backups to benefit the needs of an application, all available online at:

http://publib-b.boulder.ibm.com/cgi-bin/searchsite.cgi?query=tivoli

TSM by itself supports only data files and sparse files, but when used in conjunction with user programs or RDBMS utilities, TSM supports RDBMS objects and Raw devices along with data and sparse files.

Product Service Levels

Because the network connection between the TSM server and the client server affects the performance of backups and restores, it is important for DET and the customer agency to establish “level of service” expectations before backup services are put into production.

Training

Because State agency Client Server Administrators provide some of the Tivoli administration functions, DET will help ensure that these Client Server Administrators are provided with informational material that includes helpful hints and tips on configuration of the TSM client software, as well as information on where to obtain more formal training.

DET Customer Support

DET Customer Support provides help to address technical problems related to Tivoli Backup and Restore Services for Open Systems. Response to any Help Desk trouble ticket will be within the specified parameters as described below:

DET Customer Support
Time to Initial Response targets for submitted problems are two business hours for low and medium priorities, one clock hour for high priorities, and thirty clock minutes for urgent priorities.
Total Time to Resolution targets for problems are twelve business hours for low priorities, ten business hours for medium priorities, six clock hours for high priorities, and two clock hours for urgent priorities.
Performance against Initial Response and Resolution targets is measured regularly.
Customer satisfaction is measured regularly.
Service outages are analyzed to determine root causes and to indicate future preventative measures.

System Requirements

IBM’s TSM supports the following operating systems:

- Hewlett-Packard HP-UX
- IBM AIX
- IBM OS/390 UNIX System Services
- Linux
- Microsoft Windows 32-bit Intel for Windows XP / NT / Me / 2000 / 98 / 95
- Novell NetWare
- Sun Solaris

- Others (Contact DET)

Servers being backed up via Tivoli must be connected to the State of Utah WAN. Because TSM is a network backup product, the larger the links between client server and TSM server, the faster the data will be backed up and restored. The size and throughput of the network or WAN connection between the client server and the TSM server, therefore, has a dramatic effect on the throughput that can be achieved.

DET uses the TCP/IP protocol for all TSM data communications.

Related DET Products

Related DET Products	
Open Systems Storage High Availability	DET owns and maintains a highly available SAN fibre channel storage environment in the Salt Lake City and Richfield data centers. Open Systems Storage is available for use by State agency-owned Open Systems servers hosted in the Salt Lake or Richfield data centers.
Open Systems Storage	DET maintains a SATA SAN storage environment that can be used for primary disk storage data that does not require the higher availability of fibre channel disk.
Qualified Dedicated Storage	DET offers a dedicated disk storage environment for those customers that want to store large amounts of static, non-critical data at a low cost.

Product Rate

Rates	
Billable Item	**Rate[1]**
Tivoli Backup and Restore Services for Open Systems	$0.0010/MB/month

Ordering the Product

An order form is available on the ***its.utah.gov*** web site. Select ***Products and Services***, then ***Data Storage and Backup Products***, and finally, ***Tivoli Backup/Restore Services for Open Systems***. The Order Form can be found in the right panel. If you need further help, please contact your Customer Relationship Manager.

Product Agreement

DET and the Customer agree that this Product Description together with an approved Product Order Form constitute a binding agreement between both parties for the Product and related services required by the Customer. This Agreement remains in effect according to the terms specified in the Product Order Form, or until canceled by either party upon a thirty (30) day written notice.

Product and/or Service Rates listed are in accordance with the approved ITS Rate Schedules. Therefore, the product description and order form replaces all other documentation, i.e., Contracts, Special Billing Agreements (SBA), Service Level Agreements (SLA), Memorandums of Understanding (MOU), etc.

To the extent that the terms set forth above conflict with an existing Contract, Special Billing Agreement (SBA), Service Level Agreements (SLA), Memorandums of Understanding (MOU), or other agreement between ITS and the customer, the parties acknowledge that the foregoing shall supersede the earlier agreement.